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ABSTRACT

This guide is intended to assist administrators, curriculum directors, and teachers throughout Illinois in assessing and revising their current industrial technology education programs. The first section discusses the rationale behind the Illinois state plan for industrial technology education and lists the program's overall goals and objectives. The Illinois state plan for technology education, beginning at the elementary school level and proceeding through the middle school level to high school, vocational center, and community college and university programs, is outlined. The next section contains a more detailed description of the program of technological studies that has been planned for grades K-5. The next three sections detail the following levels in the Illinois program: exploring industry and its technologies (grades 6-8), orientation to industrial technologies (grades 9-10), and preparation programs, which focus either on preparing students who intend to seek postsecondary training in a technical field or for students who wish to become gainfully employed or advance in an industrial-related occupation (grades 11 through adult). The seventh section presents step-by-step guidelines for implementing the state plan, beginning with deciding whether or not to adopt the program model, comparing an existing program with the model, and developing a program improvement plan. A section describing various types of program development resources concludes the guide. (MN)

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The Illinois Plan for Industrial Technology Education

An Implementation Guide

Illinois State Board of Education

Adult, Vocational and Technical Education

ED296091

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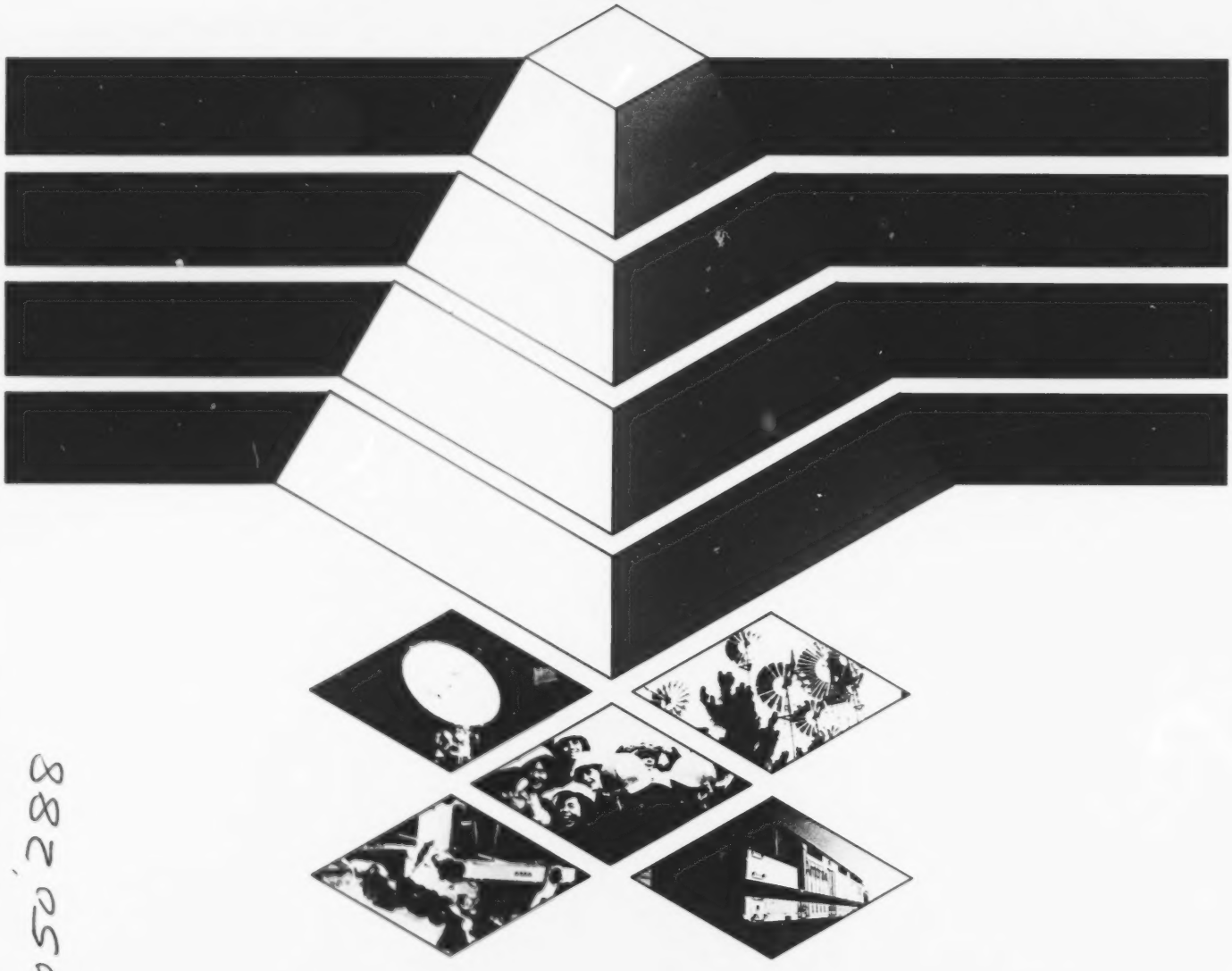

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The Illinois Plan for Industrial Technology Education

An Implementation Guide

Foreword

During the past several years, the Illinois State Board of Education has sponsored many activities for the purpose of improving the education of our citizens. This Implementation Guide is a result of one of these activities.

It is important for our young people to become **technologically literate** if they are to be productive citizens and wise decision makers. The ideas presented in this Guide will help concerned industrial technology educators develop a comprehensive plan to achieve this goal.

I encourage administrators, curriculum directors, and teachers throughout the state to use this document as they assess their current programs and make revisions that will better prepare our citizenry to live in the Twenty-first Century.

Ted Sanders

Ted Sanders, Superintendent
Illinois State Board of Education

Contents

Introduction	2
Rationale	3
Illinois Plan for Industrial Technology Education	4
Technological Studies (K-5)	6
Exploring Industry and Its Technologies (6-8)	8
Orientation to Industrial Technologies (9-10)	10
Preparation (11-Adult)	12
Implementing the Illinois Plan for Industrial Technology Education	14
Resources	Inside Back Cover

Introduction

With the advent of the 80's, the Illinois State Board of Education (ISBE), Department of Adult, Vocational and Technical Education (DAVTE) funded a comprehensive study of industrial education. The main purpose was to develop a model for industrial education that would best meet the needs of students preparing to live most of their lives in the Twenty-first Century. Advisory committees composed of representatives from business/industry and education were formed. After two years of gathering information, writing, reviewing, reacting, and revising, the Ilinois Plan for Industrial Education evolved.

Then, in 1982, ISBE directed the State Superintendent of Education to conduct a comprehensive policy study on the issue of "Education for Employment." This study revealed several dramatic challenges affecting education and, in particular, vocational education. These are: 1) continuing and rapid technological change; 2) increasing change in the characteristics of the work force; 3) education should support the economic stability of individual citizens as well as the State of Illinois. In light of these challenges, the Illinois Plan for Industrial Education was again reviewed and modified. The result is presented in this Implementation Guide.

This document provides a general curricular framework for industrial technology education from Kindergarten through the adult levels. Within this framework, there is a great deal of flexibility so instructors can use their creativity to deliver the most up-to-date instruction possible. Thus, it serves as a useful tool for all technology educators as they plan curricula to meet the needs of their students within their facilities and resource constraints. This Guide is designed to help the instructor to: develop an understanding of the philosophical base upon which industrial technology education is founded, and provide curriculum framework that will give direction to educators who design programs and courses.

For the past several years, teachers in Illinois have been designing, testing, and revising curriculum materials to implement the ideas contained in this document. The availability of these materials is described at the end of this document.

Rationale

Throughout history, humans have been producers, communicators, and travelers. However, during this century, the way these activities have been conducted has undergone rapid change. These changes have been caused by a phenomenon known as **technology.** Through **technology,** human potential has been multiplied many times over. Because of **technology,** humans can now engage in virtually instant worldwide **communication, travel** faster than the speed of sound, and **produce** durable goods through a high degree of automation. Yes, **technology** has truly changed the way we live.

Since **technology** has had, and continues to have, an enormous impact on our way of life, it seems appropriate then, that all persons should be able to understand and use **technology.** Industrial technology education (ITE) must prepare to meet this challenge.

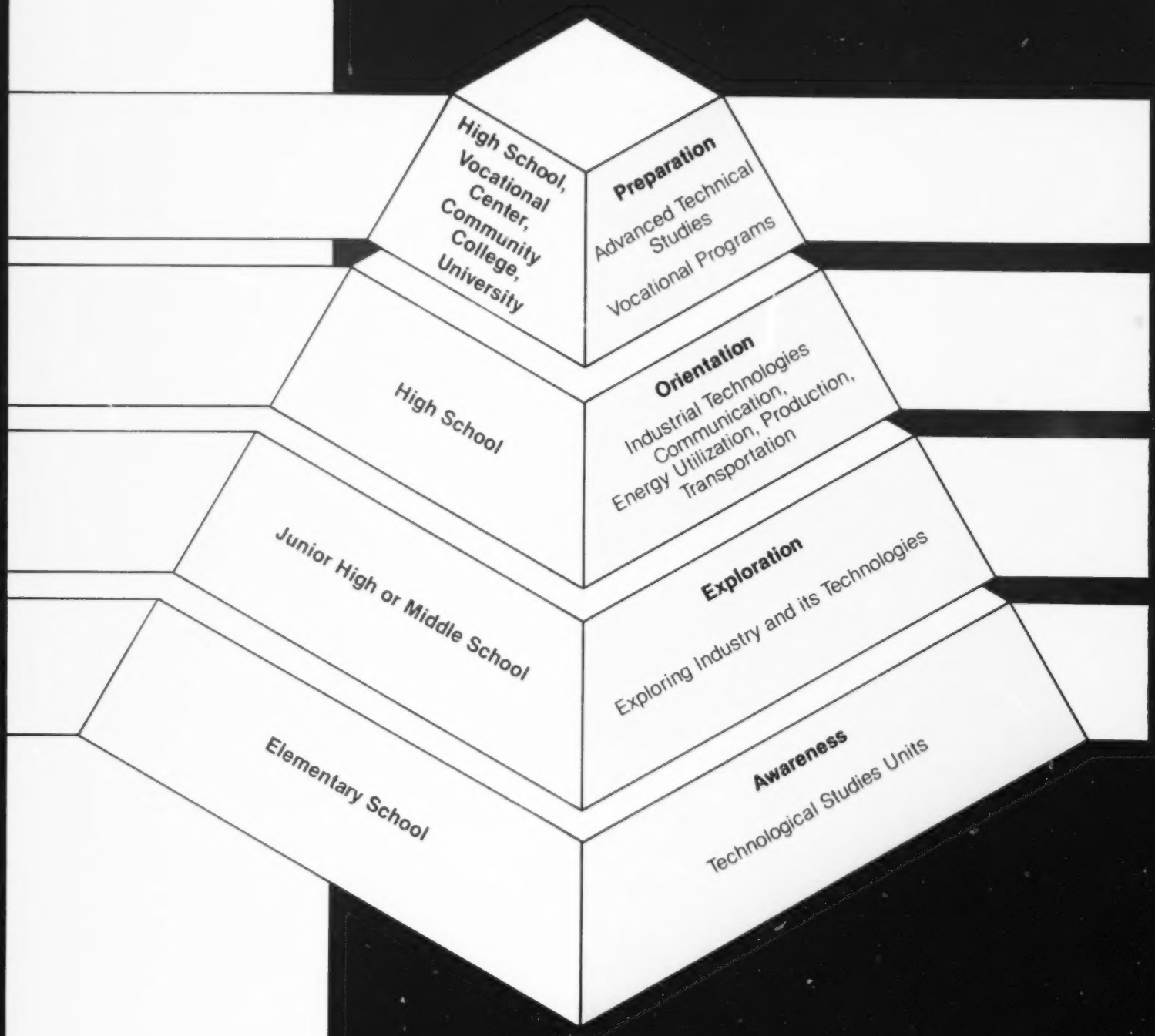
The overall goal of ITE:

to help students become technologically literate and equipped with the necessary skills to cope with, live in, and work in a highly industrial/technological society.

Objectives:

- to foster an awareness of industrial technology and its impact on society and the environment
- to provide opportunities to explore a wide range of industrial situations as well as some of the technologies used in industry
- to orient students to the industrial technologies of communication, energy utilization, production, and transportation
- to use technical information and skills to solve problems related to an advanced technological society
- to prepare students with the necessary knowledge and skills to become gainfully employed or advance in industrial-related occupations.

To achieve this end, the Illinois Plan for Industrial Technology Education (IP for ITE) is organized into four levels beginning with Kindergarten and continuing through adult life. The model on the next page graphically describes the IP for ITE for schools in Illinois.


High School, Vocational Center, Community College, University
Preparation
Advanced Technical Studies
Vocational Programs
High School
Orientation
Industrial Technologies
Communication,
Energy Utilization, Production,
Transportation
Junior High or Middle School
Exploration
Exploring Industry and its Technologies
Elementary School
Awareness
Technological Studies Units

Technology Education

Later, students should have the opportunity to either be engaged in advanced technical studies designed to introduce them to the principles of technology through experimentation and problem solving activities, or they should have the opportunity to select a vocational program designed to provide employment skills for a variety of industrial occupations.

Early in high school, students should be oriented to the technologies of communication, energy utilization, production, and transportation. These technologies should be studied in the context of resources, processes, industrial applications, and the impact they have on society and the environment.

In the junior high school, students should explore industry and its technologies. Students should be introduced to a broad spectrum of technological activities and concepts.

The elementary school curriculum provides many opportunities for technology-type activities to be integrated into the regular curriculum. The primary objective of these activities should be to help children develop an awareness of technology.

Technological Studies (K-5)

The content for this level can be taken from any of the five traditional disciplines typically in the elementary school. (See model on page 9.) Often, content in these areas is related to industry and technology. Since technology can be described as a study of "technique," it implies action. Therefore, you will want to select activities that give authenticity and relevance to the content. As you select learning activities to implement into regular elementary school classes, there are several questions that you will need to keep in mind. These questions (taken from *Teaching Children About Technology* by Mary-Margaret Scoby, p. 33) should help you to determine whether the activity may be a beneficial addition to your curriculum.

Make sure the activity is needed.

- Does it emerge from previous experiences of children?
- Do the children recognize the need for the activity?
- Does it contribute to the overall purposes of the unit?
- Does it enrich concept development?
- Does it lead to a clearer understanding of human processes and activities?

Ascertain whether or not the activity is educationally sound.

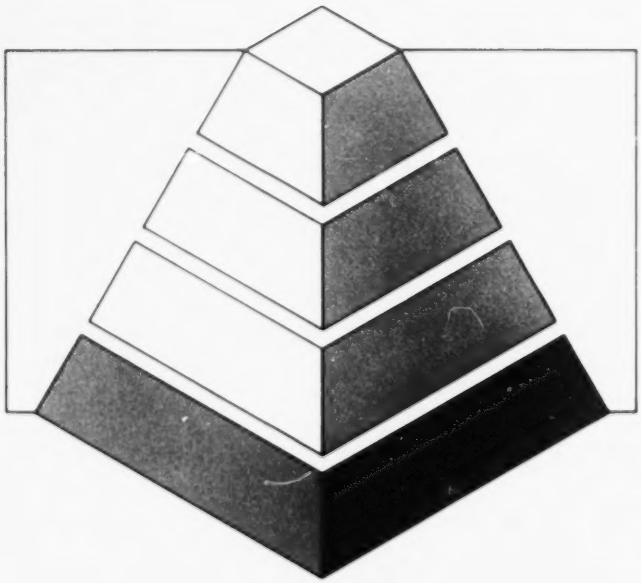
- Is the experience appropriate to the developmental level of the children in terms of motor control, intellectual understandings, and social abilities?
- Can the activity be successfully experienced and understood?
- Are the problems of importance to the life and everyday experience of the children?
- Will the experience give stimulation to intellectual and psychological processes of thinking, feeling, understanding and appreciating?
- Does the motivation come naturally and easily?

- Is the end product utilized adequately?
- Is it conducive to critical thought and cooperative problem solving?

Assure the authenticity.

- Is it a real activity of the times and people being studied?
- Is the process reconstructed accurately?
- Are the materials and tools to be used reasonably authentic, available, and practical to the situation?
- Is the finished product sufficiently realistic to provide understanding of the real product?
- Can the activity or its product be used to promote understanding of technology?

Do not be concerned that one activity meet *all* the guidelines presented by these questions. Instead,



you will need to determine if the activity is *needed, educationally sound,* and *authentic.*

The model attempts to communicate how the study of technology relates to the areas of study generally associated with an elementary curriculum.

The next step is to locate (or write) an outline of the course that you teach. Look to modern industry

for technology-type classroom activities to help teach the content.

Compare your course outline with the curriculum model above.

Then begin to integrate concepts about technology into your current course outline. Always keep the *goal and objectives* in mind as you do so. Remember that you want to enhance your curriculum by helping students to:

- become technologically literate;
- be able to cope with, live in and work in a highly technological society, and become aware of industry and technology and their impact on society and the environment.

An example activity is described below.

Suppose the children are to learn about the Nineteenth Century westward expansion in the United States. To give authenticity to this content, each child is assigned to make a structure for a new community using materials and techniques similar to that era. This could include a school, the general store, houses, railway station, stable, blacksmith shop, roads, bridges, sawmill, etc. Through an activity of this type, students begin to "experience" the content and are motivated to learn. Further, the skillful teacher will compare the situation under study with current conditions including the impact technology has had on the many changes.

K-5 Curriculum Model

Language Arts
Social Studies
Science
Mathematics
Fine Arts

▷

Technology Activities

▷

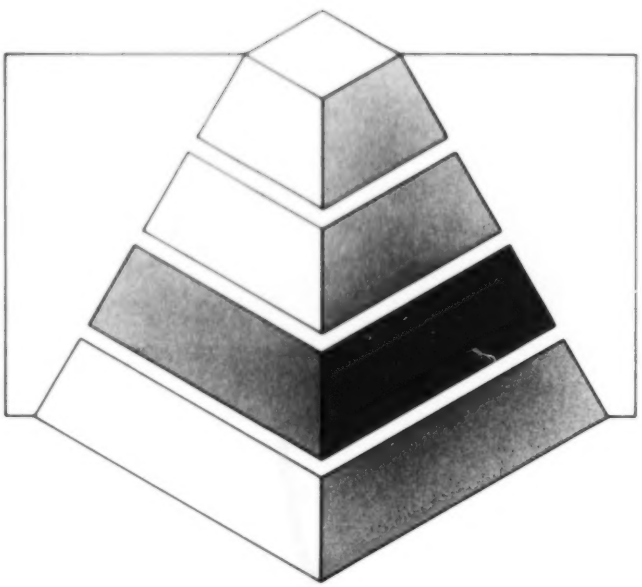
Technological Impact

Exploring Industry and Its Technologies (6-8)

At the junior high level, the teacher is presented with many options for curriculum content. The primary objective is to help students to explore industry and its technologies. Communication, energy utilization, production, transportation and the impact of these technologies has been identified as the content for this level. To provide junior high students with a broad exploration, it would seem, then, that a curriculum that included something from each of the systems would be a good foundation for students to build on as they explore industry and its technologies.

Take a look at the junior high curriculum model below.

The model should help you to visualize what the content of junior high industrial technology courses could encompass. Twenty-four units have been prepared which reflect topics drawn from this model. Listed below are the titles of the units which have been written and tested. Read these to get an idea of some opportunities available to you.



Communication

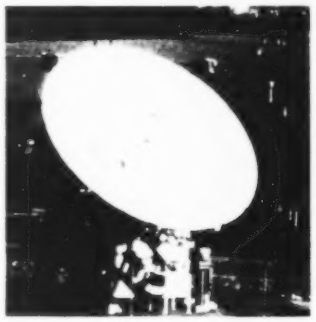
- Using the Language of Industry
- Exploring Computer Technology
- Exploring Photography
- Exploring Graphic Communication
- Exploring Electronic Communication

Energy Utilization

- Exploring Solar Energy
- Using Alternate Energy Sources
- Conserving Energy Sources
- Exploring Electricity/ Electronics
- Exploring Mechanical and Fluid Systems

Production

- Exploring Materials and Processes



- Exploring Construction Technology
- Research and Development
- Exploring Manufactured Systems
- Servicing Products

Transportation

- Exploring Land Transportation Systems
- Exploring Aviation Technology
- Exploring Water Transporation Systems
- Exploring Space Transportation Systems
- Exploring Materials Handling Systems

Impact of Industry and Technology

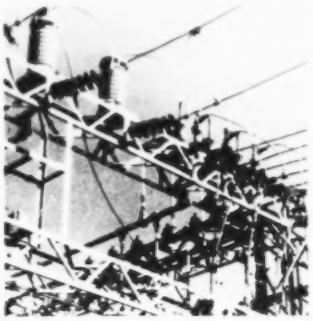
- Recycling Materials
- Limiting Pollution
- Exploring Careers in Industry and Technology
- Exploring Technology and the Future

Since most students take less than two years of ITE, it is necessary to consolidate the content. In the spirit of explora-

tion, it is important to identify a theme for each block of time you have students.

Example:
to explore the production of goods and structures, as well as the communication technologies involved.

Also, review the learning outcomes for math, science, social studies and language arts available from the Illinois State Board of Education. Since technology is so interdisciplinary in nature, you will be able to help students achieve these outcomes while they study



In this case, you will want to select and coordinate lessons from the units listed under Communication and Production.

technology. Occasionally, this becomes the first time students notice the practical application for the knowledge they learn in these subjects.

(6-8) Curriculum Model

Exploring Industry and Its Technologies

Communication
- Design
- Drafting
- Graphic Arts
- Photography
- Computers
- Broadcasting
- Telecommunications

Energy Utilization
- Harnessing
- Converting
- Transmitting
- Storing
- Conserving

Production
- Managing
- Researching
- Developing
- Producing
- Marketing
- Servicing

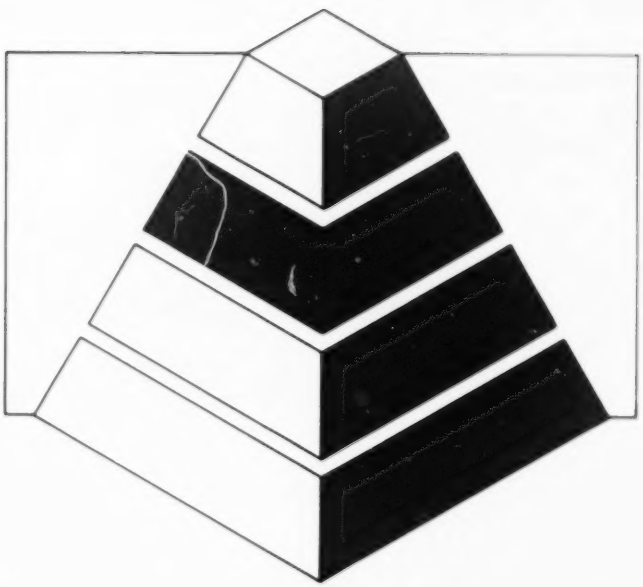
Transportation
- Air
- Land
- Water
- Space
- Underground

Impact of Technology

Environmental
- Pollution
- Recycling
- Conservation

Societal
- Employment
- Technical Developments
- Human Needs

Orientation to Industrial Technologies (9-10)



The model Education for Employment program should include a strong 2-4 semester **orientation** component. This portion of the curriculum should be available to all high school (especially 9th-10th grade) students within the regional delivery system.

Each orientation level course should include technological content, generalizable skills, transition skills, vocational ethics and career awareness.

Technological Content
The major human activities are to communicate, produce, transport, and to use energy to do these things. It seems logical, then, that the study of the technologies used to do these activities becomes the content for the orientation program in industrial technology education. Thus, four one semester courses titled Communication Technology, Energy Utilization Technology, Production Technology, and Transportation Technology make up the orientation level program for ITE. These courses should be studied in the context of the technological resources, technical processes, industrial application, and the technological impact (see Figure A).

These components help to define the curriculum in terms of a "system." That is, each topic includes input-process-output as well as the results of this sequence of events. In this way, the learner can begin to develop "technological literacy." The curriculum guides designed for each of the four orientation level courses further explain the use of this curriculum mode.

Generalizable Skills
Although technological content is extremely important, generalizable skills can also be developed through methods of instruction. Students need to learn how to:

- reason effectively;
- apply mathematics and science principles to solve problems;

- transmit and receive ideas orally and in writing;
- make decisions;
- develop a positive attitude;
- work productively in groups;
- develop and achieve goals and objectives.

The new curriculum guides weave these skills into suggested learning activities.

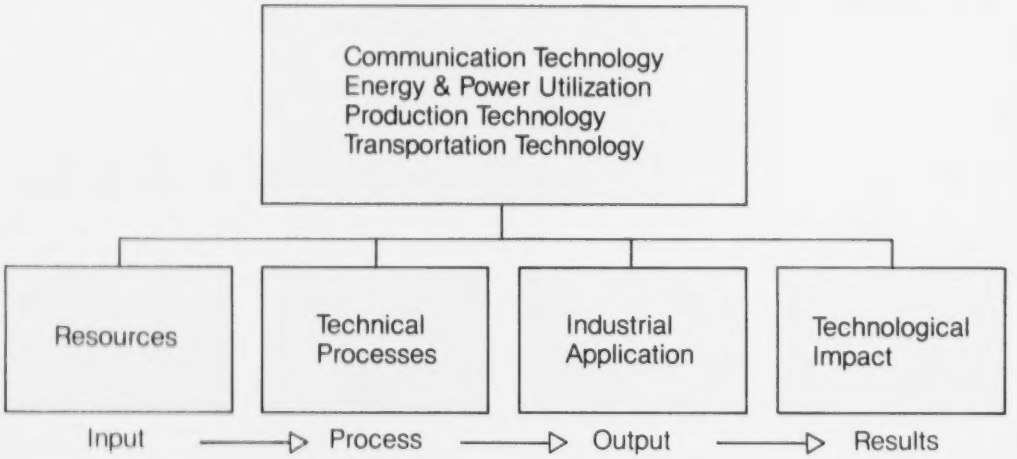
Transition Skills
Life includes a series of transitions. One not only moves from infancy to childhood through adolescence and adulthood, but also, persons often find themselves living in a new community and/or changing employment. Thus, it is important to include activities that help the student to learn to cope with stress, loss, grief, and change, as well as make decisions and solve problems.

Vocational Ethics
As students move from the orientation courses through the preparational level program into the work force, they will invariably find themselves working with others. Thus, the development of interpersonal and intrapersonal skills that relate to resolving conflicts becomes a high priority. For this reason, the orientation level program should include group activities and experiences that will support the development of these skills.

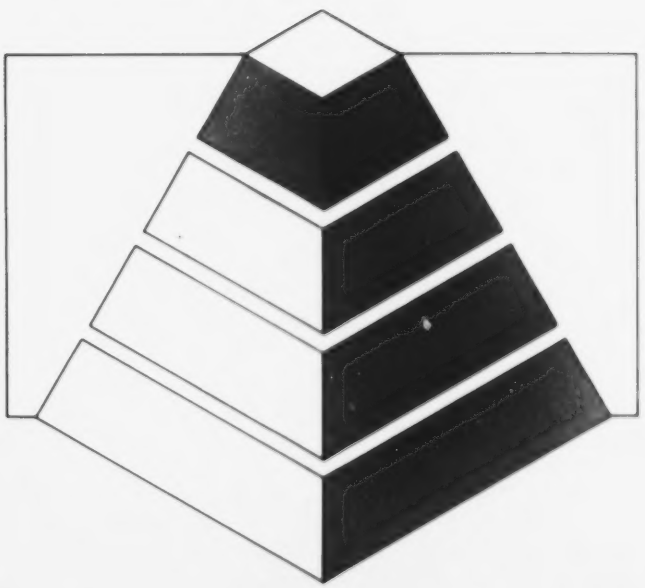
Career Awareness
One of the advantages of a broad based orientation level course is that it is easy to relate a wide range of careers to the content under study. An exposure to a variety of career opportunities available, as well as discovery of requirements and duties of those careers should also become an integral part of the orientation program.

The Ultimate Advantage
If you want to become successful in motivating students and providing opportunities for students to grow in all the areas to be addressed at the orientation level, then you should continue or begin a vocational student organization (AIASA or VICA). To obtain information on starting a youth organization, contact the occupational consultants at the ISBE/Department of Adult, Vocational and Technical Education (217/782-4877).

Figure A



Preparation Level (11-Adult)



Advanced Technical Studies

Advanced Technical Studies at the upper high school through adult level should be available to students who intend to seek further education prior to entering a specific vocational program of study. Typically, a technology course in this category focuses on the application of scientific principles. The "Principles of Technology" course is an ideal example of an Advanced Technical Studies course because it prepares the student to enter the 'technical preparation" cluster of occupations typically taught in community colleges.

Vocational Industrial Programs

The primary aim of Vocational Industrial programs is to prepare students with the knowledge and skills necessary to become gainfully employed or to advance in an industrial-related occupation.

The identification of a viable program is dependent on student interest and labor market information (LMI) to assure the availability of employment for program completers.

Once employment opportunities have been established for a specific occupation, the curriculum process begins with a "task list" for the occupation. Occupational consultants from the Department of Adult, Vocational and Technical Education (DAVTE) have task lists available for most occupations. They will assist in obtaining a task listing for unique programs.

The task list for each occupation must undergo local verification. Task list verification alternatives include:

1. Structured Group Interview (SGI)
   The Structured Group Interview involves a one-day meeting of six to ten commerce and industry workers employed in the job title being verified. A trained facilitator leads the workers through a structured process to identify and verify tasks. A complete and sequenced list of tasks, grouped by duty area, is the result of this alternative.

2. Program Advisory Committee
   This involves a formal sesson with the Program Advisory Committee to review the task list and identify tasks which could be added, modified, or deleted.

3. Mail Survey
   A questionnaire is developed and sent to a representative sample of incumbent workers in the job title to obtain

their opinions as to the importance of each task. Data are compiled and the result is a new verified task list representative of the job title.

4. Worker Interview/ Shadowing
   This technique involves following, observing, and interviewing a sample of workers on the job to determine the tasks performed.

Once the task listing has been verified, the next step is to determine whether or not a task analysis is needed. This is done by comparing the verified task list to the existing curriculum. A thorough task analysis will reveal 1) the steps leading to task performance, 2) the related knowledge, 3) attitudes, 4) performance standards, 5) tools and machines and, 6) safety concerns.

A task analysis is available for many of the new and emerging occupations as well as new duty areas in existing occupations You are advised to check with ISBE/DAVTE to determine the availability of these materials.

In most cases, the curriculum materials already in use will continue to be of value, however, care should be taken to assure that all new duties and tasks are representative of changing technology.

Employability Skills
All preparation level vocational programs must include employability skills. These are 1) identifying employment opportunities; 2) applying employment seeking skills; 3) interpreting employment capabilities; 4) demonstrating appropriate work behavior; 5) maintaining a safe and healthy environment; 6) maintaining business-like image; 7) maintaining working relationships with others; 8) communicating on the job; 9) adapting to change; 10) understanding how a business works; 11) performing mathematical skills.

Self-Evaluation
It is imperative that vocational programs undergo annual self evaluation. The evaluation components should include:

- up-to-date regional and local labor market information;
- student satisfaction;
- placement of program completers;
- employer satisfaction;
- student performance;
- enrollment;
- cost containment.

The results of this evaluation will provide input for a program (course) improvement plan.

Implementing the Illinois Plan for Industrial Technology Education

The process of implementing programatic change in a regional delivery system is an extremely complex and delicate endeavor. It must be accomplished in ways that maintain the integrity of all people involved. And, since humans inherently resist some changes, the key to smooth implementation is to have a staff who truly believe the overall goal of the Illinois Plan for Industrial Technolgy Education will best meet the needs of students. To achieve this end, careful planning must ensue. To give direction to this process, a two phase Implementation Model is proposed (see page 16).

Phase I

Phase I (usually takes a year) includes the overall process of deciding whether or not to make changes. Thus, the entire staff must have a clear understanding of the philosophy of the Illinois Plan for ITE. To accomplish this, a series of staff development activities should be planned. These may include:

- regional workshops;
- visits to neighboring schools that have implemented ITE;
- visits from DAVTE Occupational Consultants;
- other expert consultants;
- in-service university classes specifically designed for implementing the Illinois Plan.

It is much easier to go into the process of actually implementing industrial technology education when the staff has a clear understanding of the overall direction and the reasons for making changes. This philosophical base will help them answer questions such as: Should students be exposed to technology at an early age? Should the curriculum prepare technologically literate citizens? Should all students have the opportunity to study technology? Should the K through Adult curriculum be articulated (elementary, secondary and post-secondary)? Should students who exit preparation level programs be employable? When most staff members give an affirmative response to these questions, then they are ready for Phase II of the implementation model.

Phase II (Implementation)

Overall Program Level
Once administrators, counselors, and teachers are convinced that the Illinois Plan for Industrial Technology Education is a viable alternative for students, then Phase II can begin.

The first step is to describe the existing industrial education program. Initially, this involves a general description. This description should include components such as:

- a detailing of the technological awareness activities included in the elementary curriculum;
- the number of courses (including time allocation), students, and teachers at the middle/junior high school level;
- a description of the advanced technical studies courses available to students;
- a listing of the vocational industrial programs, the course sequence for each, the number of students and teachers;
- an explanation of the articulation agreements between the various high schools in the region, as well as with community colleges.

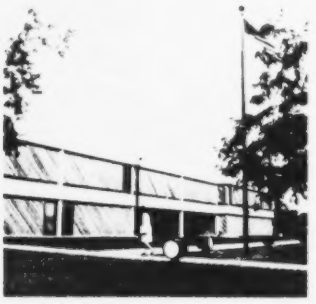
A review of this information will typically reveal areas of deficiency. For example, one may find that even though a career education component exists in the elementary school, there is no procedure for assisting elementary teachers to include technological-type activities in their regular programs. Or, one may find that even though outstanding vocational industrial programs exist in the high school, there are no articulation agreements with the local community college.

This description should then be compared to the Illinois Plan for Industrial Technology Education as described in this implementation guide. As general areas of difference surface, they should be listed so an implementation plan can be developed.

Developing an Implementation Plan

By looking at the differences noted between the existing program and the Illinois Plan for Industrial Technology Education, one can begin to formulate an implementation plan. Typically, a goal will be developed regarding each of the levels of instruction in the Illinois Plan for Industrial Technology Education. For example, one goal might become, "By September 1, 19–, an in-service program will be in place to prepare elementary teachers to utilize technology-type activities in their regular classes." Each goal should be followed with a series of activities that will assure the attainment of the goal. Each activity should include who will be responsible, when it should be completed, the task involved, and the level of expectation for each task.

It is common for the implementation plan to be projected for at least three years. Each year, the plan should be reexamined and adjusted to fit the situation.



More Specific Course by Course Level

Phase II should also include a review of each course in the K-adult industrial education program. This portion of Phase II is typically completed by teachers. They are in a position to provide far more detail concerning the situation with regard to specific program and courses. Thus, they should describe the existing courses by providing:

- the title of courses within each level of the ITE Curriculum;
- a course outline and/or task listing (preparation level) for each level;
- the number of students in each course;
- the length of the course;
- the sequence of courses that lead to a specific industrial occupation or cluster of occupations.

Then, the teachers should obtain course materials specifically designed for the Illinois Plan for Industrial Technology Education and compare the components of those courses with the existing program and courses.

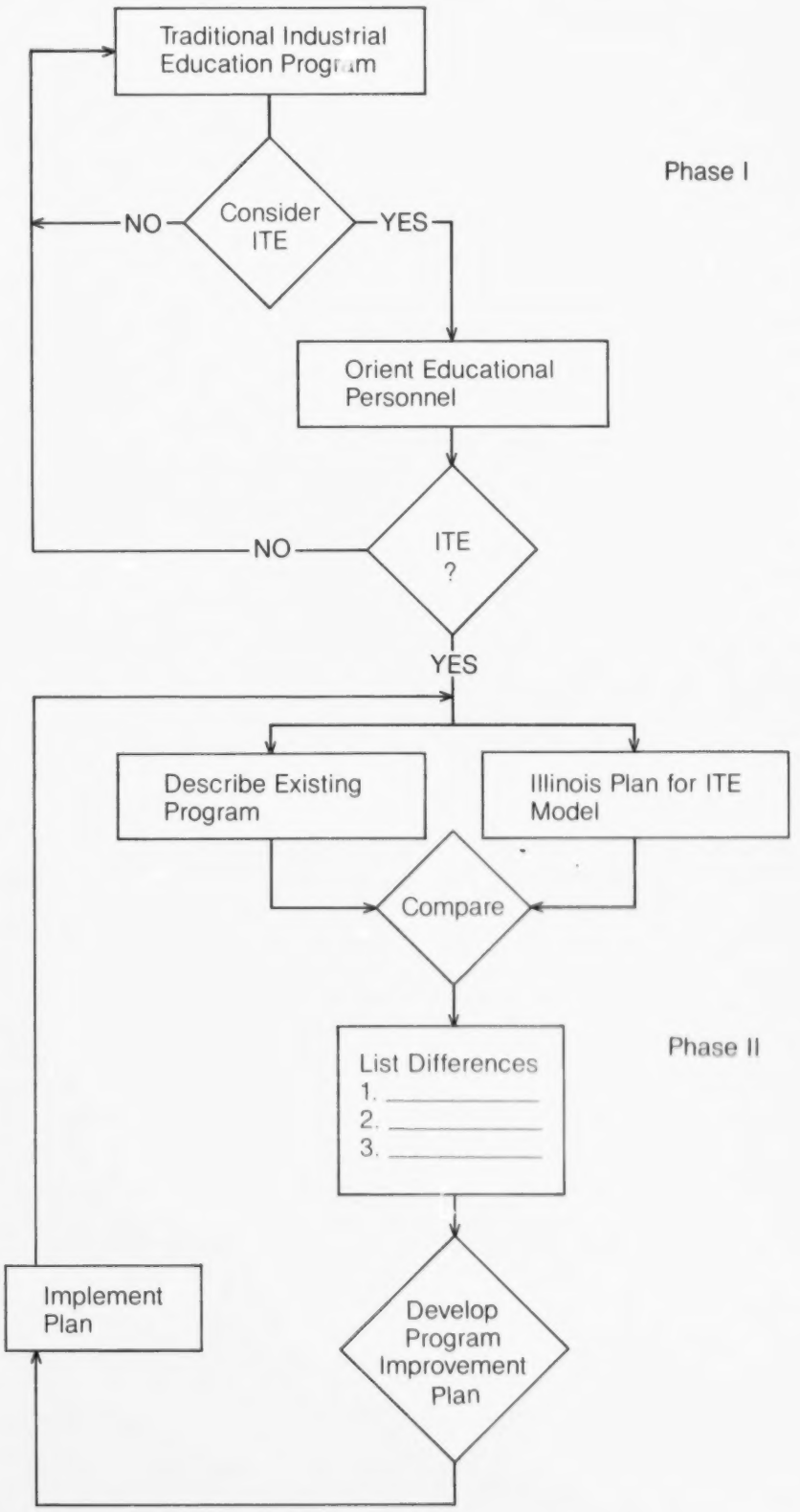
Similarly, they too, should list the differences and begin to formulate an Implementation Plan that will serve to make their program and courses more in line with the ones developed for the Illinois Plan.

To follow through then, the Implementation Plan should include goals and activities necessary to attain the goals. An example goal might be to "infuse and identify generalizable skills, transition skills and vocational ethics skills into the existing orientation courses." This assumes that the career awareness and technical content of these courses is congruent with the Illinois Plan, however, improvements are in order. Activities to reach this goal will surely include some type of in-service activity to acquaint teachers with these skills, as well as how they can be integrated into the curriculum. Then teachers should be given the resources (time and support) to revise their courses.

Summary

It is important to develop an Implementation Plan that will cause positive change in ITE curriculum and instruction. This Plan should have goals for the overall ITE Program, as well as goals that relate to each course. A series of activities should be identified that will assure the attainment of the goals. Each activity should include a timeline, the person responsible, the nature of the activity and a standard of performance. This Plan should cover several years and be updated each year so resources can be allocated to areas in the curriculum most in need of improvement. In this way then, efficient and effective education for employment programs will be assured.

A Model for Implementing the Illinois Plan for Industrial Technology Education (ITE)



Resources

Prepare to Teach the New Content
There are many ways to become prepared to teach Industrial Technology Education. Some suggestions for keeping updated are:

Attend Workshops
Updated workshops are continually being held throughout the state. These workshops may cover specific topics such as computers, CADD, CNC, or some other speciality. Workshops of a more general nature will be held on an ongoing basis to assist teachers in the implementation of the Illinois Plan.

Visit Business/Industry
Take time to participate in activities of business and industries in your area. Consider visiting several large industries each year to get a first-hand view of the processes and operations they use.

Visit Other Schools
You can learn from other teachers who are already doing new things. Most are happy to show you around if given some advance notice of your interest in visiting.

Contact Universities
University faculty can provide assistance, suggestions, names of consultants, materials, and other help. In addition, in-service activities can be provided to your school system.

Work in Business/ Industry
Many companies are willing to set up temporary positions for educators to enable them to obtain experience in a business or industry. Look into an opportunity like this for a few weeks during the summer. Graduate credit or wage compensation can often be arranged.

Contact the State Board of Education
You may wish to have a specialist visit your school or you may wish to inquire about other schools to visit. Materials on a variety of subjects/ topics are available. Call the industrial technology consultants at (217) 782-4877.

Read Books, Technical Literature and Recent Periodicals
A wealth of information is available for your professional reading. Curriculum materials developed for the Illinois Plan contain extensive resource lists.

Write to Organizations and Companies
The four area guides contain many suggested sources of additional information. Most are reasonably priced or free.

Important Curriculum Sources
Illinois Vocational Curriculum Center, Sangamon State University, Springfield, IL 62708
Phone: (217) 786-6376 or Toll Free in Illinois, (800) 252-8533

Curriculum Publications Clearinghouse, Western Illinois University, Horrabin Hall 46, Macomb, IL 61455
Phone: (309) 298-1917 or Toll Free in Illinois (800) 322-3905

Join Your Professional Organization
Illinois Industrial Education Association
Contact (217) 782-4877 for names of current officers and directors

Illinois Vocational Education Association
Contact (217) 544-815 for names of current officers and directors

American Industrial Arts Student Association (AIASA) and Vocational Industrial Clubs of America (VICA)
Contact (217) 782-4877 for the names of current officers and directors

International Technology Education Association
1914 Association Drive
Reston, VA 22091

American Vocational Association
2020 North 14th
Arlington, VA 22201

Credit
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